

was the very individual from which the figure in Lister was taken, as it agrees perfectly in size as well as general contour; and is evidently, from the comparative faintness of its coloration as well as its general appearance, a very old shell.

XLIII. — *Experiments on the Transformation of the Cystoid Worms into Tæniæ.* By C. T. VON SIEBOLD\*.

I WAS the first to advance, in the second volume of my 'Manual of Physiology,' published in 1844, the statement that the cystoid worm which lives as a parasite in the livers of rats and mice (the *Cysticercus fasciolaris*) was nothing but a stray *Tænia* which had become vesicular, and which was in fact the tape-worm of the eat (*Tænia crassicollis*). I also affirmed that the *Cysticercus fasciolaris*, like all other Acephalocysts, never possessed sexual organs, and therefore could only propagate by sexual generation when it found a suitable body, where it would lose its vesicular form and acquire the power of sexual development.

In the experiments made at the Institute of the University of Breslau, these transformations took place, as soon as the liver of a mouse or rat, previously ascertained to contain a *Cysticercus fasciolaris*, had been devoured by a cat. In the stomach of the cat, the livers of these Rodents were digested, whilst the worms contained in them remained unhurt; this parasite lost the caudal vesicle filled with fluid, and was then to be seen, without a tail, in the chyme of the stomach and small intestines of the cat, where, finding itself in a suitable place, it became developed in the articulated form of a tape-worm (*Tænia crassicollis*) with adult sexual organs. The perfect agreement of the head of the *Cysticercus fasciolaris* with the cephalic extremity of the *Tænia crassicollis*, as well as the fact that the different phases of development of the latter are often to be met with side by side in the intestines of cats, conducted to the preceding conclusion, which has received the approbation of many naturalists, but the correctness of which is still doubted by others.

Last year, Dr. Kuchenmeister, of Zittau, made some experiments with the *Cysticercus pisiformis*, which is frequently met with in the cysts of the coats of the intestines of the hare and rabbit. He caused some dogs and cats to devour these cysts, in the hope that after some time they would be developed in the intestines of these animals in the form of tape-worms. This experiment succeeded completely with the dogs, thus confirming that which

\* From the Ann. Sci. Nat. 3 ser. xvii. p. 377.

I had only been able to establish by the comparison of the *Cysticercus fasciolaris* of rats and mice with the *Tænia crassicollis* of cats ; but neither M. Kuchenmeister's experiment nor the consequences to be deduced from it were satisfactory to physicians and naturalists. He was charged with having published his experiments before they could be considered properly terminated. The discussion which arose on every side on this question was by no means calculated to throw much light on the subject, especially as M. Kuchenmeister did not appear to have sufficient knowledge of helminthology to be able to affirm positively the identity of the species indicated by him. This has determined me to go over the subject again, making use especially of young dogs, and causing them to swallow not only the *Cysticercus pisiformis*, but also the *C. cellulosus* and *tenuicollis*, the *Cænurus cerebralis*, and the *Echinococcus veterinorum*. In this work I have been zealously seconded by M. Lewald, my pupil. The following results were obtained with *Cysticercus pisiformis*.

These cystoid worms, the size of which did not exceed that of a pea, and which were still contained in the cyst of the intestinal membrane, were introduced by means of milk into the stomachs of some young dogs, to the number of from thirty to sixty individuals to each. These dogs were then killed by means of chloroform at various intervals of time, and the contents of the stomach and intestines carefully examined, when the worms which had been swallowed as food were readily observed in various states of development.

Two hours after they were swallowed, all the cystoid worms still remained in the stomach, but in most cases the cysts in which they had been enveloped had disappeared ; at the same time most of the worms which had been deprived of their cyst had also lost their terminal vesicle, which had either been digested or still adhered in fragments to the abdominal extremity. All the worms found in the stomach, whether with or without their vesicle, had the head and neck withdrawn into the body.

Three hours after ingestion there were no longer any worms in the stomach ; they had all passed with the chyme from this organ into the small intestine. Then, after having lost their cyst and terminal vesicle by the digestive action of the stomach, they all, without exception, as though feeling themselves at home, had again pushed out the head and neck. In all, a distinct lesion was perceptible at the abdominal extremity, at the point where the terminal vesicle had existed.

In dogs killed several days after the ingestion of the *Cysticerci*, these worms were found greatly increased in size ; the largest had attained a length of 3 inches, the smallest of 1 inch. The body, at first merely wrinkled transversely, now distinctly ex-

hibited the articulations, and the point torn by the loss of the vesicle actually presented a cicatrix.

After twenty or twenty-five days, the worms were several inches in length; they were articulated to the extremity of the abdomen, and the last of their joints still bore the cicatrix above mentioned, which was still very perceptible; traces of sexual organs even were already to be discovered in the posterior segments.

At the end of eight weeks the worms had attained a great length (the longest were from 36 to 39 inches). The sexual character of their posterior segments was completely developed, a great number of ova in a state of maturity being contained in them. Some individuals had already separated their last joints in a perfectly mature state.

In the *Cysticercus pisiformis* thus elongated, I recognized the *Tænia serrata* of the dog. The extremity of the head, the form of the segments, the nature of the organs of generation, and above all of the mature ova of this worm, agreed exactly with the same parts of the *Tænia serrata*. There was no longer therefore any doubt that the *Cysticercus pisiformis* of the hare and rabbit is to the *Tænia serrata* of the dog, what the *Cysticercus fasciolaris* of the mouse and rat is to the *Tænia crassicollis* of the cat.

The *Tænia serrata* is rarely found in watch-dogs or house-dogs, but more commonly in coursing dogs, which is easily explained by the fact that the latter frequently devour the intestines of hares and rabbits captured in the chase, and consequently swallow the *Cysticercus* more frequently than other dogs.

Although the experiments with the other worms above mentioned are not yet completed, those relative to the *Cœnurus cerebri* are sufficiently advanced to convince me that this worm, so dreaded by the sheep farmers, becomes transformed into a *Tænia* in the intestines of the dog. As yet, the *Tæniæ* thus produced by the *Cœnurus cerebri* have not, in my experiments, arrived at the adult state, the sexual organs not being yet mature; it is therefore impossible to determine the species to which they belong, but I hope shortly to be able to do so. I hope also that I shall be able to indicate to those interested in the raising of sheep, the means of opposing the development of this parasite in the brain of that animal, for I am convinced that the cystoid worms are not produced by a local generation, but by the microscopic ova of the tape-worms of certain Carnivora, and that when these ova are accidentally introduced into the bodies of Rodent or Ruminant animals, they are not developed there into elongated tape-worms, but into cystoid worms, which, according to the importance of the organ in which they take up their

abode, exercise a more or less fatal influence upon the life of the animal in which they live.

The experiments commenced on the *Echinococcus veterinorum* are sufficiently advanced to enable us to declare that this cystoid worm also belongs to a *Tænia*. A quantity of these destructive worms given to some young dogs, showed at the end of a few days myriads of exceedingly delicate *Tænia*s, which already adhered to the mucous membrane of the small intestine by their four suckers and their crown of hooks. All these *Tænia*s only possessed as yet three divisions in the body—one for the head and neck, a small joint behind this, and lastly a long segment. In these two joints the sexual organs had commenced their development; but this was not sufficiently advanced to enable one to be certain that these little *Tænia*s were adult, or to determine the species. I am continuing the experiment and hope soon to be able to publish the result.

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XLIV.—*Some Account of a Dredging Expedition off the coast of the Isle of Man during the months of May, June, July and August 1852.* By T. C. EYTON, Esq., F.L.S., F.Z.S.

[Continued from p. 285.]

THE following is a list of Echinodermata taken with the dredge and on shore:—

*Ophiura texturata*. Dredged off Maughold Head: not very plentiful.

*Ophiocoma neglecta*. Under stones and roots of *Laminaria* off Derby Castle at low water mark.

—— *granulata*. Dredged off Laxey in abundance.

—— *rosula*. Very common.

—— *bellis*. Dredged off Laxey in 16 fathoms water.

*Uraster glacialis*. Not very common round the island.

—— *rubens*. Common.

*Cribella oculata*. Common in from 10 to 20 fathoms water, but not so much so as in from 5 to 10 fathoms, or as on the Welsh coast.

*Solaster endeca*. Dredged off Maughold Head and Laxey, but not very common.

—— *papposa*. Common.

*Palmipes membranaceus*. I took only three specimens, one off Douglas Head and two off Laxey Head.

*Asturina gibbosa*. Only once found in a cavity of the rock opposite Derby Castle.

*Asterias aurantiaca*. Several specimens were dredged up, but it does not appear to be very abundant.